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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/687,288

10/15/2003

Wang Yueh

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7538

8791

7590

05/11/2006

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EXAMINER

CHACKO DAVIS, DABORAH

ART UNIT

PAPER NUMBER

1756

DATE MAILED: 05/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/687,288

Applicant(s)

YUEH ET AL

Examiner

Daborah Chacko-Davis

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 23 February 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of: \_\_\_\_\_
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-5, 7, and 10-14, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,759,739 (Takemura et al., hereinafter referred to as Takemura) in view of U. S. Patent Application Publication No. 2005/0074699 (Sun et al., hereinafter referred to as Sun).

Takemura, in the abstract, in col 1, lines 10-13, in col 3, lines 30-37, in col 4, lines 3-14, in col 5, lines 1-24, in col 6, lines 66-67, in col 7, lines 1-30, discloses a process of patterning features on the substrate (super LSIs) by forming a photoresist layer on the substrate (integrated device to be fabricated), wherein the photoresist includes an alkali-soluble resin, and a photoacid generator (photoactive), exposing the photoresist layer to EUV (excimer radiations) such that selected portions (exposed portions) are rendered soluble in the developer (during the developing process) by the acid generated by the photoacid generator during exposure, and the unexposed portions are inhibited from being rendered soluble in the developer (claims 1, 3, 7, 10, 12). Takemura, in col 4, lines 3-6, discloses that the alkali-soluble resin is polyhydroxystyrene (claims 2, and 11). Takemura, in col 10, lines 43-47, discloses that the photoactive agent contains a phenyl group (claims 4, and 13). Takemura, in col 5,

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lines 20-24, discloses that the acid unstable group is a carbonyl group (claims 5, and 14).

The difference between the claims and Takemura is that Takemura does not disclose that the photoresist layer is non-chemically amplified.

Sun, in [0039], discloses that the chemically amplified photoresist layer can be replaced with a non-chemically amplified photoresist layer.

Therefore, it would be obvious to a skilled artisan to modify Takemura by replacing the photoresist layer of Takemura with a non-chemically amplified resist layer as suggested by Sun, because Sun, in [0039], discloses that the non-chemically amplified photoresist layer can be used for performing photolithographic processes in a shorter wavelength range (less than 365nm).

3. Claims 1, 6-7, 10, and 15, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,358,599 (Cathey et al., hereinafter referred to as Cathey) in view of U. S. Patent Application Publication No. 2005/0074699 (Sun et al., hereinafter referred to as Sun).

Cathey, in the abstract, in col 3, lines 36-68, and in col 4, lines 5-44, in col 6, lines 18-20, discloses a process of patterning a semiconductor device in a lithography tool, the device including a plurality of structural layers by forming a photoresist layer on the structural layers, wherein the photoresist includes a photoactive compound that prevents selected portions of the resist from being solubilized by the developer, exposing the resist to UV radiation (EUV), and said acid generator renders selected

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portions (unexposed non-crosslinked portion) of the resist soluble in the developer during the development step (claims 1, 7, and 10). Cathey, in col 4, lines 40-44, disclose that the resin is a poly vinyl phenol resin (claims 6, and 15).

The difference between the claims and Cathey is that Cathey does not disclose that the photoresist layer is non-chemically amplified.

Sun, in [0039], discloses that the chemically amplified photoresist layer can be replaced with a non-chemically amplified photoresist layer.

Therefore, it would be obvious to a skilled artisan to modify Cathey by replacing the photoresist layer of Cathey with a non-chemically amplified resist layer as suggested by Sun, because Sun, in [0039], discloses that the non-chemically amplified photoresist layer can be used for performing photolithographic processes in a shorter wavelength range (less than 365nm).

4. Claims 8-9, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,358,599 (Cathey et al., hereinafter referred to as Cathey) in view of U. S. Patent Application Publication No. 2005/0074699 (Sun et al., hereinafter referred to as Sun) as applied to claims 1, 6-7, 10, and 15, above, and further in view of U. S. Patent Application Publication No. 2004/0204328 (Zhang et al., hereinafter referred to as Zhang).

Cathey in view of Sun is discussed in paragraph no. 3.

Cathey, in the abstract, in col 3, lines 36-68, in col 4, lines 5-44, in col 5, lines 1-10, and in col 6, lines 18-44, discloses a process of patterning a semiconductor device

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in a lithography tool, the device including a plurality of structural layers (metal layers), patterning the photoresist layer formed on the structural layers to form a photoresist etch mask, wherein the photoresist etch mask is used to etch the exposed structural layers underlying the mask, followed by stripping the remaining photoresist mask (claim 8).

The difference between the claims and Cathey in view of Sun is that Cathey in view of Sun does not disclose that the patterns formed in the device have a critical dimension of approximately 15 nm. Cathey in view of Sun does not disclose that the line wide roughness of the feature is less than 2 nanometers (claim 9).

Zhang, in [0019], discloses that the features formed in the device have a critical dimension less than 2nm, and a line width roughness of less than 2nm, and that the line width roughness is within 8% of the critical dimension.

Therefore, it would be obvious to a skilled artisan to modify Cathey in view of Sun by employing the method of patterning taught by Zhang, because Zhang, in [0019], discloses modifying the photoresist formulation and adjusting the latent image results in a pattern of reduced roughness.

### ***Response to Arguments***

5. Applicant's arguments, see Remarks, filed February 23, 2006, with respect to the rejection(s) of claim(s) 1-15 under 35 U.S.C. § 102 and § 103 have been fully considered and are persuasive. Therefore, the rejections made in the previous office action (paper no. 0915) have been withdrawn. However, upon further consideration,

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new grounds of rejection are made in view of U. S. Patent Application Publication No. 2005/0074699 (Sun et al., hereinafter referred to as Sun). See paragraph nos. 2, and 3.

A) Applicants argue that neither Takemura nor Cathey disclose a non-chemically amplified photoresist.

Neither Takemura nor Cathey is depended upon to disclose the use of a non-chemically amplified photoresist layer. Sun is depended upon to teach the use of a non-chemically amplified photoresist layer for the patterning process. See paragraph nos. 2, and 3.

### ***Conclusion***

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dcd

May 5, 2006.



**JOHN A. MCPHERSON  
PRIMARY EXAMINER**